

THREE NEW SPECIES OF STONEFLIES (PLECOPTERA) FROM THE OZARK-OUACHITA MOUNTAIN REGION

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Abstract.—Three new species of Plecoptera representing three families are described from the Ozark-Ouachita Mountain region: *Allocapnia oribata* (Capniidae), *Alloperla caddo* (Chloroperlidae), and *Isoperla szczytkoi* (Perlodidae). Morphological descriptions, illustrations, biological notes, and comparisons with other regional species are provided. All stages of *Isoperla szczytkoi* are described.

Stark et al. (1983) and Ernst et al. (1986) have recently described new *Alloperla* and *Neoperla* species from the Ozark-Ouachita Mountain region of central North America. During our ongoing study of the regional Plecoptera fauna, three additional species representing three families were discovered. The following descriptions and morphological terms follow those of Ross and Ricker (1971), Surdick (1981), and Szczytko and Stewart (1976, 1979, 1984).

Allocapnia oribata Poulton and Stewart, NEW SPECIES

Figs. 1-3

Male.—Micropterous. Color dark brown in alcohol. Length of body 5.5-6.5 mm; wings reaching 6th tergum. Seventh tergum without a dorsal process, but with a distinct rounded membranous area connected to posterior margin (Fig. 2). Eighth tergum with anterior margin sloping abruptly upward from base forming a sclerotized process, appearing as rounded knob in lateral view (Fig. 1), and wide, shallow, and U-shaped in dorsal view (Fig. 2). Eighth tergum process subconical in posterior view (Fig. 3). Upper limb of epiproct narrow, and slightly wider apically in dorsal view (Fig. 2), with subequal proximal and distal sections, and cla-

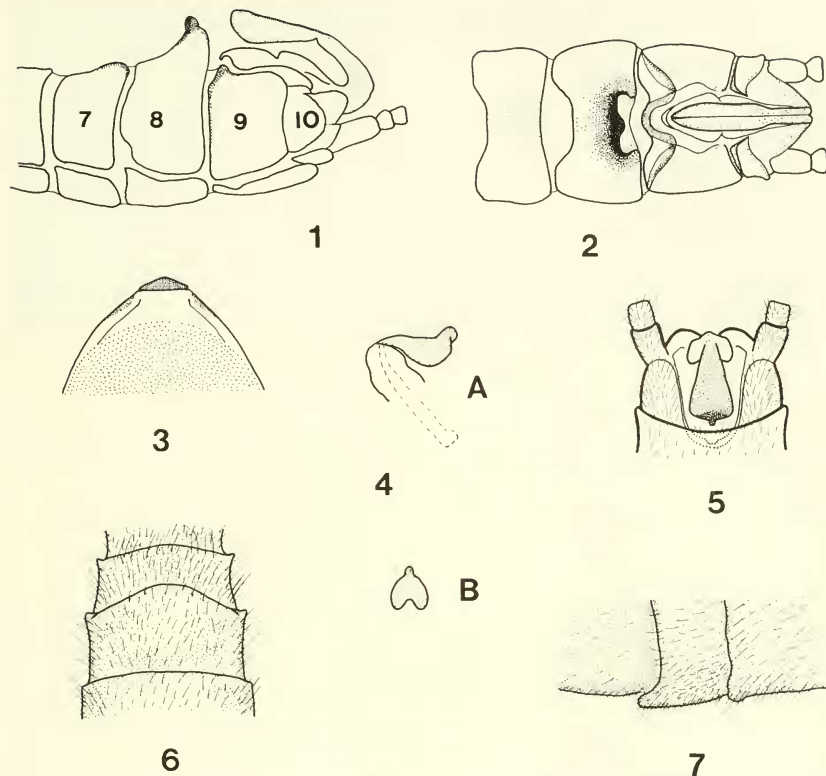
vate apically in lateral view (Fig. 1). Upper and lower epiproct limbs subequal in length in lateral view, and lower limb spatulate and abruptly curved downward at tip (Fig. 1).

Female.—Unknown.

Material examined.—Holotype ♂, Arkansas, Searcy Co., Middle Fork Little Red River, Hwy 65 @ Shirley, 6-I-1985, B. C. Poulton; two additional ♂ in poor condition, same locality and date, B. C. Poulton; 1 paratype ♂, Arkansas, Van Buren Co., Archey Creek, Hwy 254, 12.1 km NE Rupert, 6-I-1985, B. C. Poulton. Holotype deposited at United States National Museum, paratype deposited at North Texas State University museum.

Etymology.—The species name is derived from the Greek root *oribat-*, meaning "mountain roaming."

Diagnosis.—The species represents the first discovery of a new *Allocapnia* from the Ozarks since *A. warreni* Ross and Yamamoto (1966). It is not clear which Ross and Ricker (1971) group this species belongs to, since: 1) the epiproct upper limb and the shape of the eighth dorsal process in dorsal view are typical of the pygmaea group; however the process is unnotched, and 2) the arcuate elevated posterior ridge of the eighth dorsal process is characteristic of the recta



Figs. 1-3. *Allocapnia oribata*. 1, Lateral terminalia, ♂. 2, Dorsal terminalia, ♂. 3, Posterior view, 8th dorsal process, ♂. 4-7, *Alloperla caddo*. 4, Lateral (A) and anterior (B) view, ♂ epiproct tip. 5, Dorsal terminalia, ♂. 6, Ventral, ♀ subgenital plate. 7, Lateral, ♀ abdominal segments 7-9.

group (Figs. 1, 3). Even though *A. oribata* is similar to *A. malverna* Ross of the recta group, neither it nor *A. malverna* have the thin blade-like epiproct upper limb typical of *A. recta* (Claassen) and other members of that group.

Biological notes.—The type males were collected on bridges from permanent, 4th order streams which have rock-rubble substrate. Large numbers of *A. mohri* Ross and Ricker, *A. rickeri* Frison, and *A. granulata* (Claassen) were also collected at these lo-

calities. Females of these species exhibit considerable variation in subgenital plate form; therefore we were unable to discern the female of *A. oribata*.

Alloperla caddo Poulton and
Stewart, NEW SPECIES
Figs. 4-7

Male.—Macropterous. General color amber to white in alcohol. Forewing length 6-7 mm; body length 5-7 mm. Abdominal dorsal stripe absent. Epiproct tip ca. 2×

longer than wide; lateral margins convergent near base (Fig. 5); anterior margin sharply upturned in lateral view and with a prominent anterior knob visible in dorsal view (Figs. 4A, 5). Epiproct tip with ventral groove visible in front view (Fig. 4B). Lateral and dorsal abdominal setae present, with longer brushes of setae on segments 7-9, and dorsally on segment 10. Posterior margin of abdominal pleura 8 and 9 with 4-8 brown spinules. Basal cercal segments with thick setae ca. $1-2 \times$ segment width. Aedeagus membranous.

Female.—Macropterous. Color similar to male. Forewing length 6-7 mm; body length 5-7 mm. Subgenital plate little produced, with posterior margin rounded in ventral view (Fig. 6), and slightly protruding ventrad in lateral view (Fig. 7). Cercal and abdominal setae similar to male. Fine setae on subgenital plate (Figs. 6, 7) ca. $\frac{1}{2}$ length of lateral setae. Vagina membranous.

Material examined.—Holotype ♂, allotype ♀, 7 paratype ♂, and 4 paratype ♀, Arkansas, Garland Co., Middle Fork Saline River, Hwy 7 at Iron Springs Rec. Area, 6-VI-1984, B. C. Poulton; 4 paratype ♂ and 1 paratype ♀, Arkansas, Perry Co., Dry Fork Creek, Hwy 7, 14.3 km S. of Hollis, 6-VI-1984, B. C. Poulton; 4 paratype ♂, Arkansas, Perry Co., Bear Creek, Hwy 7, 4.4 km SE of Hollis, 12-V-1985, B. C. Poulton.

Etymology.—This species is named after the Caddo mound builders, an American Indian tribe that inhabited parts of the Ouachita Mountains from 750-1200 AD.

Diagnosis.—Recent descriptions and an illustrated key to Ozark-Ouachita *Alloperla* were provided by Stark et al. (1983), including the new species *A. ouachita* Stark and Stewart, collected in the same region of the Ouachita Mountains as *A. caddo*. The unique saddle-shaped epiproct tip of *A. caddo* (Fig. 4) easily separates it from *A. leonarda* Ricker and *A. hamata* Surdick. The two last species have flat, blade-like epiproct tips, with either lateral serrations or

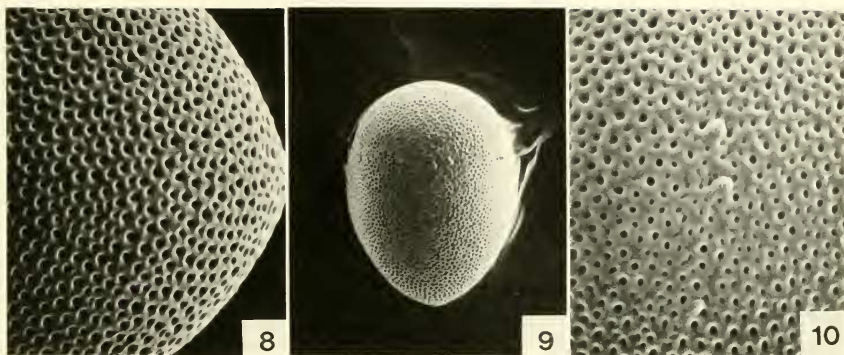
points (Surdick, 1981). *Alloperla ouachita* and *A. caudata* Frison have broadened epiproct tips, but the lateral horns of *A. ouachita* and the appressed hairs of *A. caudata* (Hitchcock, 1974; Stark et al., 1983) are absent in *A. caddo*. The membranous basal lobes of the epiproct cowl in *A. caddo* are relatively smaller than those of *A. ouachita* and *A. hamata* (Stark et al., 1983). *A. caddo* represents the only Ozark-Ouachita *Alloperla* with an evenly rounded female subgenital plate; the other species all possess pointed subgenital plates similar to those described by Surdick (1981) for *A. hamata* and *A. furcula* Surdick.

Biological notes.—The type localities are all in the Ouachita Mountains and comprise first or second order, rock-rubble, intermittent streams. Adults were collected by sweeping riparian vegetation.

Isoperla szczytkoi Poulton and Stewart, NEW SPECIES

Figs. 8-20

Male.—Macropterous. Forewing length 10-11 mm, body length 9-10 mm. Body color yellow in life, light brown to amber in alcohol, with darker pattern on head, pronotum, and thorax. Head with brown circular patch enclosing light spot, connecting median ocellus with anterior frons; lateral and median ocelli connected with an inverted U-shaped dark band with lighter peripheral patches, posterior ones extending to near eyes and back to occiput (Fig. 15). Pronotum with median light stripe; disks medium brown with dark brown rugosities. Pronotum stripe continues through mesonotum; rest of mesonotum and metanotum light brown. Cerci and antennae medium brown. Legs light brown, tibiae darker than femora, both with darker brown bands near their articulation. Cercal segments with short plumose setae and a single, long, dark brown posteroventral seta on each segment. Wings light brown with dark brown veins. Eighth sternum with vesicle $1.5-2 \times$ wide as long



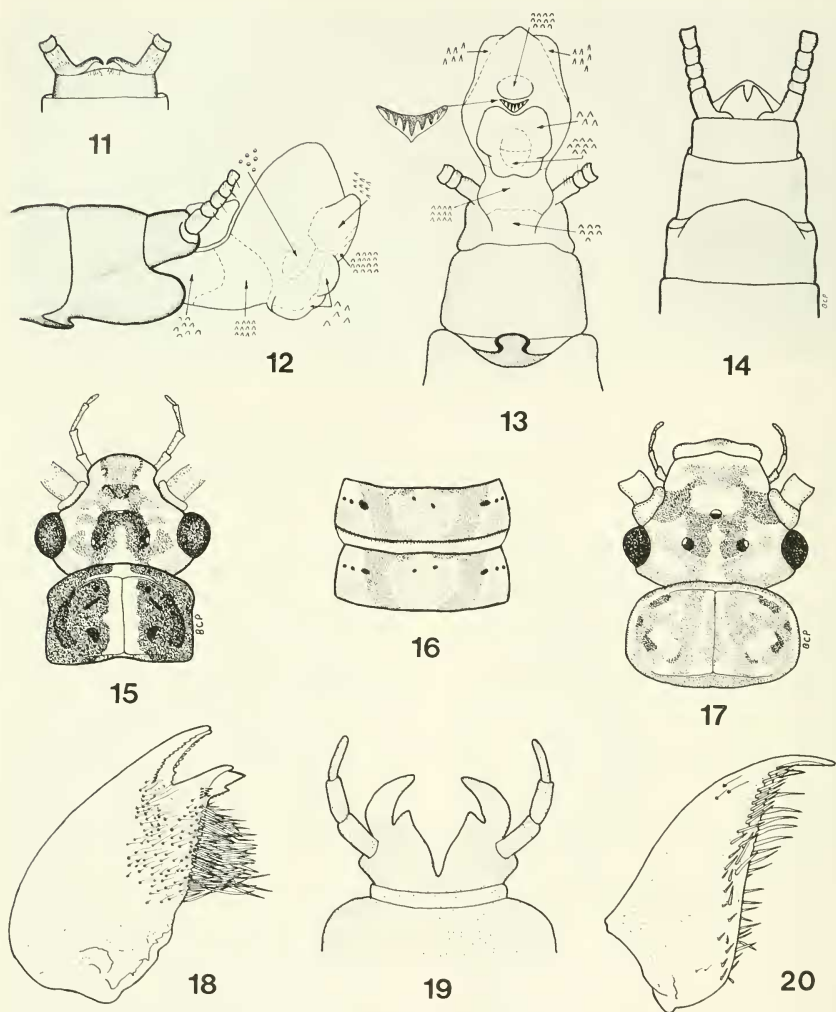
Figs. 8–10. *Isoperla szczytkoi* egg. 8, 700 \times . 9, 200 \times . 10, 700 \times .

(Fig. 13), with setae present along lateral and anterior margins. Paraprocts medium length, curving upward and inward, narrowing to a sharp point, and overlapping posterior margin of 10th tergum (Fig. 11). Ninth pleura with a single brown spot. Aedeagus membranous with bulb-like posteriodorsal section 1.5–2 \times wider than aedeagal base; posterior portion with a row of 6–7 sclerotized, digited golden brown teeth surrounded by an unsclerotized triangular area; blunt spinulae present on elevated circular region posteriodorsal to sclerotized digited teeth; ventral portion of aedeagus with elevated region containing sparse blunt spinulae, and a round patch with anterior half containing stout brown spinulae of medium density (Fig. 13). Basal portion of aedeagus with circular bands containing stout, blunt spinulae and short, rounded spinulae; lateral regions with patches of sclerotized punctures and sharp golden brown spinulae (Fig. 12). Posterodorsal tip of aedeagus without spinulae; separate membranous dorsal lobe between cerci unsclerotized and without spinulae (Fig. 12).

Female.—Macropterous. Forewing length 11–12 mm, body length 9–11 mm. Body coloration and external morphology similar to male. Subgenital plate broadly rounded

and produced posteriorly to anterior $\frac{1}{3}$ of 9th sternum (Fig. 14). Vagina membranous.

Nymph.—Body length 10–13 mm. General color brown in alcohol. Abdomen with 2 faint dorsal longitudinal stripes with light borders, appearing slightly diagonal on each segment, with a median light blotch between them; a row of 6–8 dark spots, 2 always positioned dorsally inside median light blotch, and others dorsolaterally (Fig. 16). Head pattern with dark inverted U-shaped band connecting ocelli, with light area between lateral ocelli, extending to posterior portion of head, and light oval area anterior to median ocellus (Fig. 17). Pronotum variable with median longitudinal brown band surrounded by lighter borders; irregular dark markings on discs and light lateral margins (Fig. 17). Lacinia with 2 teeth; subapical tooth $\frac{1}{3}$ – $\frac{1}{2}$ length of apical tooth and partially hidden behind 1 of 2 incomplete rows of stout hairs that continue along entire length of inner margin (Fig. 20). Labrum with median swelling (Fig. 17). Right mandible deeply cleft, with 5 short, stout apical teeth, the outer 2 with inner serrated ridges. Inner margin of mandible with a dense brush of long setae (Fig. 18). Glossae produced and broadly pointed upward at apex; paraglossae slender, curved, with length ca. 1.5–



Figs. 11–20. *Isoperla szczytkoi*. 11, Dorsal, ♂ segment 10. 12, Lateral terminalia, ♂. 13, Ventral terminalia, ♂. 14, Ventral terminalia, ♀. 15, Head and pronotum, adult ♂. 16, Abdominal tergites, nymph. 17, Head and pronotum, nymph. 18, right mandible, nymph. 19, Nymphal labium. 20, Right lacinia, nymph.

2 × width of base (Fig. 19). Posterior margin of abdominal segments with continuous fringe of hairs. Cercal segments with a dorsal row of long setae, and whorles of short hairs on posterior margins.

Egg.—Outline oval, cross section circular. Length 0.35 mm; width 0.27 mm. Collar absent. Chorion sculptured with numerous small punctations, and a few raised knobs, possibly marking a micropylar ring (Figs. 8–10).

Material examined.—Holotype ♂ and allotype ♀ (reared), Arkansas, Logan Co., Gutter Rock Creek, 33 km SE of Paris on side road near Hwy 309, 20-IV-1985, B. C. Poulton; 6 paratype ♂ and 3 paratype ♀ (reared), and 6 nymphs, same locality and date, B. C. Poulton; 1 paratype ♂ (reared), and 4 nymphs, same locality, 13-IV-1985, B. C. Poulton. Holotype, allotype, and 2 nymphs deposited at USNM; paratypes deposited at NTSU Museum.

Etymology.—This species is named in honor of Stanley W. Szczytko, who is presently working on the revision of eastern Nearctic *Isoperla* and has greatly contributed to knowledge of *Isoperla* in North America.

Diagnosis.—During our intensive sampling in the Ozark and Ouachita Mountain region, our collections have revealed a total of nine *Isoperla* species. The most recent descriptions of regional *Isoperla* are provided by Szczytko and Stewart (1976) and Stark and Stewart (1973). Stanley W. Szczytko (personal communication), has indicated that *I. szczytkoi* belongs to the *I. decepta* Frison-*I. mohri* Frison complex. Common characters of this complex include the following: 1) outer nymphal mandibular teeth deeply cleft and serrated, 2) nymphal lacinial shelf reduced, 3) nymphal subapical tooth of lacinia reduced or absent, 4) nymphal head pattern dark, 5) aedeagus with sclerotized patch-like process bearing teeth, and 6) ovum without a collar. Based on these characters, *I. szczytkoi* most closely resem-

bles *I. decepta*, another Ozark-Ouachita mountain species. Nymphs of these two species have a similar head pattern, but *I. decepta* lacks a median pronotal stripe and has a much weaker apical lacinial tooth. Adult *I. decepta* lack a contrasting head pattern as in *I. szczytkoi* (Fig. 15).

Biological notes.—This species is known only from the type locality, an intermittent first-order stream with large rubble substratum, that flows down the north side of Magazine Mountain, having the highest elevation in the Ozark-Ouachita region.

ACKNOWLEDGMENTS

We thank S. W. Szczytko for the SEM photography and helpful suggestions in diagnosing the new *Isoperla* species. This study was supported in part by National Science Foundation Grant BSR 8308422 and the Faculty Research Fund of North Texas State University.

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BOOK REVIEW

PROC. ENTOMOL. SOC. WASH.
89(2), 1987, p. 302

Foundations for a National Biological Survey. Edited by K. C. Kim and Lloyd Knutson. Association of Systematic Collections, Washington, D.C. 1986, xii + 215 pp. \$18.00.

This important book is primarily a result of a symposium presented at the annual meeting of the Association of Systematic Collections held in May of 1985 in Victoria, British Columbia. A total of twenty-four contributors examine and comment on virtually all aspects of the formation, funding, and perceived results and effects of a National Biological Survey. After a brief foreword by E. O. Wilson and a preface by the editors, the heart of the book is presented in six sections. An introduction by K. C. Kim and Lloyd Knutson addresses the scientific bases for such a Survey. This introduction provides an excellent description of what a National Biological Survey might encompass and what might be expected as a direct result of such a Survey. The introduction also provides in brief form and with well-chosen words what is expanded upon in the following sections of the volume.

The second section consists of papers summarizing the relations of such a Survey on ecological and environmental considerations. Especially cogent are the articles on the relation of systematics to long-range ecologic research and the role of a National Biological Survey on environmental protection, food production and plant protection. This is followed by a section on biological survey information in which the form of the data, how it is to be managed and how and to whom it is to be disseminated, is discussed. A fourth section dealing with

legislative and historical perspectives for a National Biological Survey examines both federal and state legislation of the past with comments on possible future legislation. A fifth section describes the ambitious biological survey programs of Australia and Canada and the results of these surveys, and discusses the formation of these surveys and their possible use as models for such a survey in this country.

A final brief section consists of two articles. First, a brief article by L. I. Nevling, Jr. summarizes the conference and provides a list of nine statements in which the contributors, representing highly diverse viewpoints, were in agreement. Second, R. M. West and W. D. Duckworth list five recommendations distilled from the presentations of the participants. A final brief epilogue by the editors completes the volume.

This reviewer found considerable variation in quality of the presentations, as is usually the case in symposium volumes. However, the editors did a remarkable job in finding excellent speakers and writers and a fine job of editing and introducing the results. Some ideas expressed in this book are of general interest, as well as of interest in relation to a possible National Biological Survey. For instance, this reviewer found Barry Chernoff's discussion of the three main relationships between ecology and systematics to be especially well expressed and thought provoking. The volume, in short, is well worth examining and should be on the shelf of anyone doing systematic, ecologic, or survey studies involving the fauna or flora of North America.

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